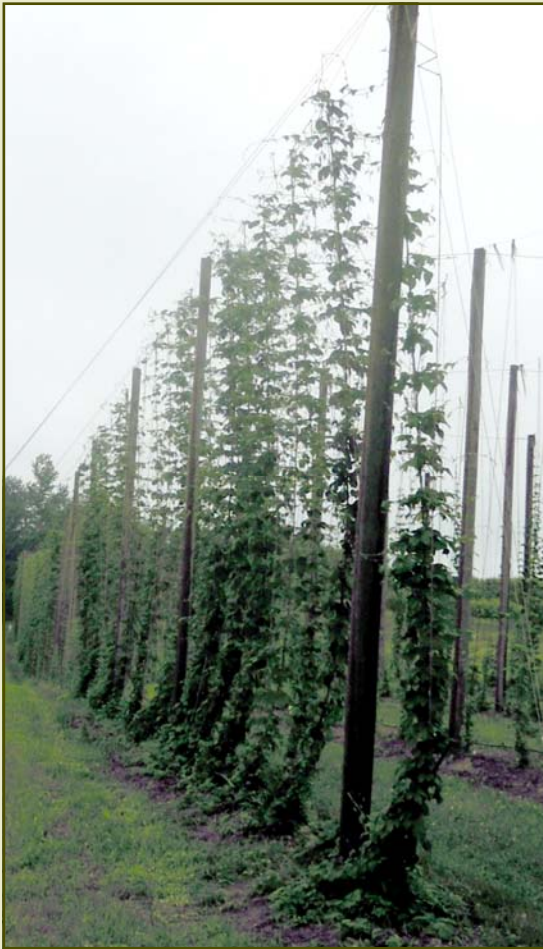


Pesticides registered for use on hops in Michigan 2014



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Extension

There has been a resurgence in hop production in Michigan, but little information has been available to assist growers in the selection of pesticides registered for use on hops in Michigan. The information presented here is intended as a guide for Michigan hop growers in selecting pesticides for use on hops grown in Michigan and is for educational purposes only. The efficacies of products listed have not been evaluated on hops in Michigan. Reference to commercial products or trade names does not imply endorsement by Michigan State University Extension or bias against those not mentioned. Information presented here does not supersede the label directions. To protect yourself, others, and the environment, always read the label before applying any pesticide.

Herbicides registered for use on hops in Michigan 2014

Trade name	Common name	WSSA code ¹	Pre or post emergence	Weeds controlled: broadleaf or grasses	Notes	PHI ²	REI ³
2,4 D– many formulations available	2,4 D	4	post emergence	broadleaf	See labels for rates and timing. Use as a directed spray to row middles. Ester* formulations restricted in certain townships in Berrien, Van Buren and Cass County- May 1-October 1.	28 d	48 hr
Aim 2 EC	carfentrazone	14	post emergence	both– burn-down and sucker control	Not registered for use on hops in Michigan- WA, OR, ID only.	7 d	12 hr
Chateau SW 51 WDG	flumioxazin	14	preemergence	both	No more than 6 oz/A. Apply Jan-Mar. as a 1-1.5 ft. band to dormant hops. See label for sucker control directions.	30 d	12 hr
Finalsan Total Vegetation Killer	ammoniated soap of fatty acids	***	postemergence	both	26 oz/1 gallon water; 2.0-5.0 gallons/1000 sq ft or as spot treatment. Avoid spraying desirable plants. OMRI listed	***	24 hr
Gramoxone and other formulations	paraquat	22	post emergence	both– burn-down and sucker control	Not registered for use on hops in Michigan- WA, OR, ID only. RUP	14 d	24 hr
Roundup and other formulations	glyphosate	9	post emergence	both	Apply only when green shoots, foliage or canes are not in the spray zone.	14 d	4 hr
Scythe 4.2 L	pelargonic acid	27	post emergence	both-burndown	Uses in hops-vegetative burn-down, directed spray, prior to crop emergence, dormant or post harvest spray.	24 hr	12 hr
Select Max 0.97 E	clethodim	1	postemergence	grasses-annual and perennial	Annual grasses- 9-16 fl oz; perennial grasses-12-16 fl oz. Use NIS at 0.25% v/v.	21 d	24 hr
Solicam 80 DF	norflurazon	12	preemergence	both	Rate determined by soil type-wait 6 months after planting for first application.	60 d	12 hr
Treflan 4EC, Treflan HFP, Treflan TR-10	trifluralin	3	preemergence	annual grasses and broadleaf weeds	Rate determined by soil type-see label. Apply during dormancy.	***	12 hr

¹WSSA = Weed Science Society of America mode of action code listed for resistance management planning. ²PHI= preharvest interval ³REI= restricted entry interval. * In general, avoid using ester formulations in hopyards growing near sensitive crops such as grapes or tomatoes due to issues with vapor drift.

Fungicides registered for use on hops in Michigan 2014¹

Trade name	Common name	FRAC ² group/ resistance risk	Downy or powdery mildew	Rates/notes	PHI ³	REI ⁴
Accrue	spiroxamine	5/ low to med	PM	18 fl oz/A	7	12 hr
Agri-Fos	phosphorous acid, mono & di- potassium salts	33/ low	DM	1.25 qt/ A in 100 gal water. Apply when shoots are 0.5-1 ft long, post training, 21 d post training, bloom, when conditions fa- vor disease.	not listed	4 hr
Aliette WDG	fosetyl-Al	33/ low	DM	2.5 lb/A. Apply when shoots are 6-12 in tall, after training; when vines are 5-6 ft tall; 3 wks after 2nd application; at bloom. Maxi- mum 10 lb/A/season. Do not use with cop- per compounds– see label.	24 d	12 hr
Badge SC	copper oxychloride copper hydroxide	M1/low	DM	1.8 pt/A. Make crown treatment after prun- ing but before training.	14 d	48 hr
Champ Dry Prill Champ Formula 2 Flowable, NuCop 3L Kentan DF Kocide 2000 Kocide 3000 Other formula- tions/ manufacturers exist.	copper hydroxide	M1/low	DM	1.33 lb/A; no more than 7.07 lb/A/yr. 1.33 pt/A; no more than 7.3 pt/A/yr. 1.33 pt/a no more than 7 pt/A/yr. 1.32 lb/A 1.5 lb/A no more than 7.57 lb/A/yr. 0.75-1.5 lb/A no more than 8.8 lb/A/yr. Apply as a crown treatment after pruning but before training. After training, additional fungicide treatments are needed at about 10 d intervals. Minimum retreatment inter- val:10 d.	14 d	48 hr
Copper-Count- N	copper diammonia diacetate complex	M1 /low	DM	2 qt/A as needed at 10 d intervals. Make crown treatment after pruning but before training; discontinue 2 wks. before harvest. No more than 13.7 qt/A/yr.	14 d	48 hr
Cuprofix-Ultra 40 Disperss Basic Copper HB	basic copper sulfate	M1 /low	DM	1.0-1.25 lb/A; no more than 6.6 lb/A/yr. 0.5-1.0 lb/A; no more than 5 lb/A/yr. Make crown treatment after pruning, but before training. After training, make addi- tional applications at 10-d intervals as need- ed. Discontinue use 2 weeks before harvest.	14 d	48 hr
Curzate 60DF	cymoxanil	27/low-med	DM	3.2 oz./A- Use only with a labeled rate of protectant fungicide such as copper hydrox- ide. 10-14 d treatment interval. No more than 4 apps/ 12 months.	7 d	12 hr
Flint 50 W	trifloxystrobin	11/high	PM	See label for mixing rates; alternate with applications of sterol inhibitor (FRAC group 3) fungicides.	14 d	24 hr

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cide Resistance Action Code ³PHI= preharvest interval ⁴REI= restricted entry interval.

Fungicides registered for use on Hops in Michigan 2014¹

Trade name	Common name	FRAC ² group/ resistance risk	Downy or powdery mildew*	Rates/notes	PHI ³	REI ⁴
Forum	dimethomorph	40 /low-med	DM	6 fl oz./A. No more than 3 applications/18 fl oz/season; minimum application interval 10 d; rotate to another mode of action after 1 application.	7 d	12 hr
Fosphite	phosphorous acid, mono & di-potassium salts	33/ low	DM, PM	1-3 qt/100 gallons water/A. apply at 2-3 wk intervals. Do not apply at intervals less than 3 d.	0 d	4 hr
Fungi-phite	phosphorous acid, mono & di-potassium salts	33/ low	DM	1-1.5 qts./A in a minimum of 100 gallons water. Apply when shoots are 6-12 inches high, after training s-shoots 5-6 ft. tall, 3 wks. after training, during bloom.	0 d	4 hr
Linebacker WDG	fosetyl-AI	33/ low	DM	5.0 lb/100 gallons– do not mix with copper compounds. Maximum 10 lb/A/season.	24 d	12 hr
MetaStar 2E Ag	metalaxyl	4/ high	DM	1 qt/ A. For soil drench when shoots are 6 inches or less after pruning, before training; foliar spray at sign of secondary infection- 1 qt/A + 2 lb/A Kocide 101	45 d	48 hr
Orius 3.6 F, Solera tebuconazole 3.6 F, Tebustar 3.6 F, Toledo 3.6 F, check for others	tebuconazole	3/ med	PM	4-8 fl oz/A; no more than 32 fl oz/ crop season. Use surfactant- see label for additional information.	14 d	12 hr
Phostrol	phosphorous acid, mono & di-potassium salts	33/ low	DM	2.5 pt/A in a minimum of 10 gallons per acre as directed foliar spray using ground equipment only. Apply: when shoots are 6 to 12 inches high; after training when vines are 5 to 6 feet tall; about 3 weeks after the second application; and during bloom.	0 d	4 hr
Prev-Am Ultra	sodium borate	unknown	DM, PM	50 fl oz/100 gal.	0 d	4 hr
Pristine	boscalid pyraclostrobin	7/med-high 11/high	DM	No more than 28 oz/A; max 70 oz/season 14 oz/100/ gal; max 3 apps/season.	14 d	12 hr
Procure 480 SC	triflumizole	3/med	PM	12 oz/A. No more than 36 fl oz./season	7 d	4 hr
ProPhyt	potassium phosphite	33/ low	DM	2-4 pt/A when shoots are 6-12 in high, after training– vines 5-6 ft tall; 3 wks. After the 2nd application; during bloom.	0 d	4 hr
Quintec	quinoxifen	13	PM	4-8.2 fl oz/A ; no more than 4 applications/season or more than 2 consecutive sprays before rotating to a different mode of action.	7 d	12 hr

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Fungicides registered for use on Hops in Michigan 2014¹

Trade name	Common name	FRAC ² group/ resistance risk	Downy or powdery mildew*	Rates/notes	PHI	REI
Rally 40 WSP	myclobutanil	3/ med	PM	2-4 oz/A– emergence to training, 7-10 d interval; training to wire- 4-6 oz/A, 5-10 d interval; 6-10 oz/A- wire to 14 d pre-harvest 7-10 d interval. Max 4 applications/2.5 lb/A/season.	14 d	24 hr
Regalia	<i>Renoutria sachalinensis</i>	P 5	DM, PM	1-4 qts/A for downy mildew control, must be tank mixed with another fungicide labeled for downy mildew.	24 d	12 hr
Revus	mandipropamid	40/ low-med	DM	8.0 fl oz/A no more than 24 fl oz/ season; no more than 2 consecutive applications.	7 d	4 hr
Ridomil Gold SL	mefenoxam	4/ high	DM	0.50 pt/A soil drench when shoots are 6 in. or less after pruning, before training or foliar spray at sign of secondary infection- combined with copper fungicide registered for hops. No more than 3 apps/season.	45 d	48 hr
Serenade Max	<i>Bacillus subtilis</i>	44/ resist. not known	PM	2-3 lb/100 gallons/A.	0 d	4hr
Sonata	<i>Bacillus pumilus</i> strain QST 2808	44/ resist. not known	DM, PM	Can be used for organic production 2-4 qts/100 gallons- see label for acre rates.	0 d	4 hr
sulfur- formulations vary	sulfur	M2/low	PM	See labels for specific directions; also see organic fungicide section.	7 d	12 hr
Stylet oil	paraffinic oil	NC/ resist. not known	PM	1-2 gallon/ 100 gallons water. Discontinue at burr development. An OMRI-approved organic formulation is available. Be cautious- phytotoxicity has been documented.	***	4 hr
Tanos	famoxadone cymoxanil	11/high 27/low-high	DM	8 oz/A no more than 6 applications/ cropping cycle. Do not make more than 1 application of Tanos before rotating to a fungicide in another FRAC group.	7 d	12 hr

For additional fungicide choices and products approved by OMRI for organic production, see the table of OMRI listed fungicides on page 6. ¹Although efforts have been made to check the accuracy of information presented at the time of printing, it is still the responsibility of the person using this information to verify that it is correct by reading the corresponding pesticide label in its entirety before using the product. Labels can and do change– greenbook.net, cdms.com, and agrian.com are free online databases for looking up label and MSDS information. ²FRAC= fungicide Resistance Action Code ³PHI= preharvest interval ⁴REI– restricted entry interval. *Powdery mildew not reported in on hops in Michigan.

OMRI⁵ listed fungicides registered for use on hops in Michigan 2014¹

Trade name	Common name	FRAC ² group/ resistance risk	Diseases	Rates/notes	PHI ³	REI ⁴
Agristar Basic Copper 53	basic copper sulfate	M1/low	DM	1.0 lb/A; no more than 5.0 lb/A/yr. apply as a crown treatment after pruning but before training. After training, additional fungicide treatments are needed at about 10 d intervals	***	48 hr
Actinovate AG	<i>Streptomyces lydicus</i> WYEC 108		Verticillium wilt, DM, PM	Soil treatment: (Verticillium wilt) 3-12 oz/A as a soil drench. foliar treatment: (downy and powdery mildew, anthracnose) 3-12 oz/A every 7-14 d.	0 d	1 hr
Badge X2	copper oxychloride copper hydroxide	M1/low	DM	0.75 lb/A; make crown treatment after pruning but before training	14 d	48 hr
Champ WG Nu-Cop 50 DF Nu-Cop HB	copper hydroxide	M1/low	DM	1.06 lb/A no more than 5.6 lb/A/yr. 1.0 lb/A no more than 5.0 lb/A/yr. 1.0 lb/A no more than 5.0 lb/A/yr. apply as a crown treatment after pruning but before training. After training, additional fungicide treatments are needed at about 10 d intervals. Min. retreatment Interval: 10 d.	14 d	48 hr
Bio-tam	<i>Trichoderma asperellum</i> strain ICC 012 and <i>T. gamsii</i> strain ICC 080		Phytophthora root rot, verticillium wilt	Apply up to 7 d before planting to initiate soil colonization before the crop is planted and at planting. See label for rates and application methods— banded, in-furrow, chemigation, nursery and greenhouse drench, etc.	***	1 hr
Cueva fungicide concentrate	copper octanoate	M1/low	Anthracnose, DM, PM, cercospora leafspot	0.5-2.0 g/100 gallons water. Apply 50-100 g/A.	0 d	4 hr
Double Nickel 55	<i>Bacillus amylo-liquefaciens</i> strain D747		PM	6-10 fl oz /100 gallons water; minimum 20 gallons/A emergence-training 50 gallons/A training to wire, 100 gallons/A wire touch to harvest.	0 d	4 hr
Eco-mate Armicarb-O	potassium bicarbonate	NC/ resist. not known	PM, DM, anthracnose	2.5-5 lb/A	0 d	4 hr
Kaligreen	potassium bicarbonate	NC/ resist. not known	PM	2.5-5 lb/A	1 d	4 hr
Sonata	<i>Bacillus pumilus</i>	44/ resist. not known	DM, PM	2-4 qts/100 gallons- see label for acre rates.	24 d	48 hr
Stylet oil	paraffinic oil	NC/ resist. not known	PM	1-2 gallon/100 gallons water. Discontinue at burr development. Be cautious - phytotoxicity has been documented.	****	4 hr

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Insecticides labeled for use on hops in Michigan 2014¹

Trade name	Common name	IRAC ² group	Pests	Japanese beetle listed elsewhere on label ³	Rates/notes	PHI ⁵	REI ⁶
Admire Pro	imidacloprid	4A	aphids	yes	2.8-8.4 fl oz/A soil application (to moist soil) 2.8 fl oz/A foliar app.	60 d 28 d	12 hr
Agrimek ,others	abamectin	6	mites	no	8.0-16.0 fl oz./A RUP⁴	28 d	12 hr
Acramite 50 WS	bifenazate	UN	mites	no	0.75-1.5 lb/A 1 application/season.	14 d	12 hr
Baythroid XL	beta-cyfluthrin	3A	aphids, flea beetle, loop-er, plant bug	yes	3.2 fl oz/A	7 d	12 hr
BioCover MLT	petroleum oil	Not listed	spider mites, (powdery mildew)	no	1-2 gallons/100 gallons/A every 10-14 d. Discontinue at burr development.	***	4 hr
Brigade 2EC	bifenthrin	3A	aphids, mites armyworms, cutworms	yes	3.8-6.4 fl oz/A RUP⁴	14 d	12 hr
Brigadier	bifenthrin imidacloprid	3A 4A	aphids, leafhoppers, armyworm and other lep. larvae, spider mites	yes	Aphid and leafhopper-3.8 -12.8 fl oz/A Armyworm, loopers, root weevils, spider mites-12.8 fl oz.A 21 d trt. interval RUP⁴	28 d	12 hr
Dicofol 4E	dicofol	UN	mites	no	2-2.33 pts/A	7 d	29 d
Dipel DF Dipel ES	<i>B. thuringiensis</i> var. kurstaki	11	loopers, armyworms	no	0.5-2 lb/A OMRI listed 1-2 pt/A loopers; 2-4/A- armyworms	0 d	4 hr
Dibrom 8 EC	naled	1B	armyworms, hop aphid	no	1 pt/A RUP⁴	7 d	48 hr
Envidor 2EC	spirodiclofen	23	mites	no	18.0-24.7 fl.oz./A one application/season.	7 d	12 hr
Fujimite XLO	fenpyroximate	21A	mites	no	3 pt/A	14 d	12 hr
Fulfill	pymetrozine	9B	hop aphid	no	4-6 fl. oz/A	14 d	12 hr
Malathion 57EC- (other formula- tions available)	malathion	1B	aphids, spider mites	yes	1 pt/A	10 d	12 hr

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³ Japanese beetle is not a pest of hops in Washington, Oregon and Idaho, where the majority of US hops are produced. Hence, it is not listed under pests for hops on many insecticide labels. The site (crop) must be listed on the label in order to legally use the product on that crop. It is legal to use a pesticide for a pest that is not listed on the label, but the rate listed on for use on the crop (hops) cannot be exceeded. Insecticides that have Japanese beetle listed for a crop other than hops have been noted in the table. Be aware that none of these products have been evaluated for efficacy against Japanese beetle on hops in Michigan. ⁴RUP– restricted use pesticide- requires RUP applicator's certificate from Michigan Department of Agriculture and Rural Development to purchase. ⁵ PHI=preharvest interval ⁶ REI=restricted entry interval.

Insecticides labeled for use on hops in Michigan¹

Trade name	Common name	IRAC group	Pests	Japanese beetle listed elsewhere on label ²	Rates/notes	PHI ⁴	REI ⁵
Movento	spirotetramat	23	hop aphid	no	5-6 fl oz/A	7 d	24 hr
Platinum	thiamethoxam	4A	hop aphid, root weevils garden symphlan	yes	8 fl oz/A as banded soil application. Limit 8 fl oz/growing season	65 d	12 hr
Platinum 75 SG	thiamethoxam	4A	hop aphid, root weevils garden symphlan	yes	2.67 oz/A as banded soil application do not exceed 2.67 oz/A per growing season	65 d	12 hr
Provado 1.6 F	imidacloprid	4A	hop aphid	yes on 2ee label for grape	8 fl oz/A 24 oz. limit/season– 21 d treatment interval.	28 d	12 hr
Pyganic and others	pyrethrin	3A	aphids, Japanese beetle	yes	1 pt-2 qts/A Pyganic is OMRI listed; check labels of others.	0 d	12 hr
Savey 50 DF	hexythiazox	10A	spider mites	no	4-6 oz/A one application/year. Apply up to burr formation.	0 d	12 hr
wettable sulfur	formulations vary	****	spider mites	no	2-6 lbs/A when mites first appear, see labels for specific rates.	0 d	24 hr
Surround	kaolin	****	flea beetles	yes	25-50 lb/A. Works as protective barrier so complete coverage is essential. OMRI approved	0 d	4 hr
Zeal	etoxazole	10B	spider mites	no	3.0-4.0 oz/A when mite populations are low one application per season.	7 d	12 hr

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OMRI listed Insecticides labeled for use on hops in Michigan 2014¹

Trade name	Common name	IRAC ² group	Pests	Japanese beetle listed elsewhere on label ³	Rates/notes	PHI ⁴	REI ⁵
Acoidal Microthiol Disperss	sulfur		spider mites	no	2-6 lb/100 gal/A . Do not use within 2 weeks of an oil treatment.	0 d	24 hr
Azadirect Ecozin Plus 1.2% ME	azadiractin (neem)	UN	aphids, Japanese beetles, others	yes	1-2 pts/A 15-30 oz/A buffer water pH to 5.5-6.5.	0 d	4 hr
Azera	azadiractin, pyrethrins	UN/3A	aphids, Japanese beetles, armyworms, others	yes	1.0-3.5 pt/A buffer water pH to 5.5-7.0	0 d	12 hr
Cosavet-DF	sulfur	M2	spider mites, powdery mildew	no	Mites-2-4 lb/100 gal/A Mildew-4-6 lb/100 gal/A Do not use within 2 weeks of an oil treatment.	0 d	24 hr
Deliver Javelin WG	<i>Bacillus thuringiensis (B.t. kurstaki)</i>	11	loopers, armyworm	no	0.5-1.5 lb/A 0.25-1.0 lb/A	0 d	4 hr
Des-X insecticidal soap M-pede	potassium salts of fatty acids	M	aphids, spider mites	no	2 gal/100 gal water in 75-200 gal/A 1-2 gal/100 gal water in min 50 gal/A	0 d	12 hr
Dipel DF	<i>Bacillus thuringiensis (B.t. kurstaki)</i>	11	loopers, armyworms	no	loopers 0.5-1.0 lb/A armyworms 1.0-2.0 lb/A	0 d	4 hr
Ecotec	rosemary oil peppermint oil	NC	spider mites, thrips	no	1.0-4.0 pt/100 gal/A spreader/adjuvant recommended.	0 d	0 hr
Entrust Entrust SC	spinosad	5	loopers, armyworms, thrips	no	1.25-2.0 oz/A 4.0-6.0 oz/A	1 d	4 hr
Grandevo	<i>Chromobacterium subtsugae</i>	11	armyworms, loopers aphids, mites, thrips	no	1-3 lb/A 2-3 lb/A	0 d	4 hr

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OMRI listed Insecticides labeled for use on hops in Michigan 2014¹

trade name	common name	IRAC ² group	pests	Japanese beetle listed elsewhere on label ³	rates/notes	PHI ⁴	REI ⁵
Kumulus	sulfur		spider mites	no	2-4 lb/A. Do not use within 2 weeks of an oil treatment.	0 d	24 hr
Mycotrol O	<i>Beauvaria bassiana</i>	biological	aphids, thrips	no	0.25-1.0 qt/A. Read label for adjuvant and tank mix restrictions.	0 d	4 hr
Omni Supreme spray	mineral oil	M	spider mites, powdery mildew	no	1-2 gal/100 gal/A discontinue at burr development. Do not mix with sulfur or apply within 30 d of a sulfur application.	0 d	12 hr
Purespray green	mineral oil	M	aphids, mites, powdery mildew, whiteflies	no	1-2 gal/A in a minimum of 50 gal water/A. Discontinue at burr development. See label for sulfur and other pesticide application restrictions.	0 d	4 hr
PyGanic EC 1.4	pyrethrins	3A	aphids, Japanese beetle,	yes	1 pt-2 qt/A	0 d	12 hr
PyGanic EC 5.0			loopers, thrips		4.5-18 fl oz/A		
Sil-matrix	Potassium silicate		aphid, mite suppression	no	2-4 qts/100 gal	0 d	4 hr
SuffOil-X	mineral oil	M	aphids, mites, powdery mildew	no	1-2 gal/100 gal water-20-100 gal/A	0 d	4 hr
Surround WP	kaolin clay		suppression of thrips	yes	25-50 lb/A	0 d	4 hr
Trilogy	azadiractin (neem oil)	UN	PM, anthracnose spider mites	no	0.5-1.0% in 25-100 g/A 1>0-2.0% in 25-100 g/A	0 d	4 hr
XenTari DF	<i>Bacillus thuringiensis (B.t. kurstaki)</i>	11	loopers, armyworms	no	0.5-2.0 lb/A	0 d	4 hr

¹ Although efforts have been made to check the accuracy of information presented at the time of printing, it is still the responsibility of the person using this information to verify that it is correct by reading the corresponding pesticide label in its entirety before using the product. Labels can and do change— greenbook.net, cdms.com, and agrian.com are free online databases for looking up label and MSDS information. ² IRAC= Insecticide Resistance Action Committee. Code included for resistance management planning.

³ Japanese beetle is not a pest of hops in Washington, Oregon and Idaho, where the majority of US hops are produced. Hence, it is not listed under pests for hops on most insecticide labels. The site (crop) must be listed on the label in order to legally use the product on that crop. It is legal to use a pesticide for a pest that is not listed on the label, but the rate listed on for use on the crop (hops) cannot be exceeded. Insecticides that have Japanese beetle listed for a crop other than hops have been noted in the table. Be aware that none of these products have been evaluated for efficacy against Japanese beetle on hops in Michigan. ⁴ PHI=preharvest interval ⁵ REI=restricted entry interval

**Signal Words and Relative Impact of Pesticides Registered for Use on Hop on Representative
Non-target Beneficial Arthropods**

Fungicides	Signal Word	Trade Name	Beneficial arthropod IOBC		rankings ¹
			Predatory mites	Lady beetles	
Active Ingredient	Signal Word	Trade Name	Predatory mites	Lady beetles	Lacewing larvae
<i>Bacillus pumilus</i>	Caution	Sonata	1	ND	ND
Boscalld	Caution	Pristine	1	ND	ND
Copper	Caution	Various formulations	1	ND	ND
Cymoxanil	Warning	Curzate 60DF	ND	ND	ND
Dimethomorph	Caution	Acrobat (renamed Forum)	ND	ND	ND
Famoxadone & cymoxanil	Caution	Tanos	ND	ND	ND
Fosetyl-AI	Caution	Aliette WDG	ND	ND	ND
Kaolin	Caution	Surround	3	ND	ND
Mandipropamid	Caution	Revus	OK ²	OK ²	ND
Mefenoxam	Caution	Ridomil	ND	ND	ND
Metalaxyl	Warning	MetaStar	ND	ND	ND
Mineral oil/petroleum distillate	Caution	Various formulations	2	ND	ND
Myclobutanil	Warning	Rally 40W	2	1	ND
Phosphorous acid	Caution	Fosphite & other formulations	ND	ND	ND
Pyraclostrobin	Caution	Pristine	ND	ND	ND
Quinoxifen	Caution	Quintec	1	ND	ND
Sodium borate	Warning	Prev-Am	2	ND	ND
Spiroxamine	Caution	Accrue	ND	ND	ND
Sulfur	Caution	Various formulations	2	ND	ND
Tebuconazole	Caution	Folicur 3.6F	1	ND	ND
Trifloxystrobin	Caution	Flint	1	ND	ND
Herbicides					
2,4-D	Danger	Weedar 64 & other formulations	ND	ND	ND
Carfentrazone (Not reg. in MI)	Caution	Aim EC	1	ND	ND
Clethodim	Warning	Select Max	1	ND	ND
Clopyralid (Not reg. in MI)	Caution	Stinger	1	ND	ND
Flumioxazin	Caution	Chateau	OK ²	OK ²	ND
Glyphosate	Caution	Roundup & other formulations	1	ND	ND
Norflurazon	Caution	Solicam	ND	ND	ND
Paraquat (Not reg. in MI)	Danger	Gramoxone & other formulations	1	ND	ND
Pelargonic acid	Warning	Scythe	ND	ND	ND
Trifluralin	Caution	Treflan & other formulations	2	ND	ND

Continued on page 12.

Continued from page 11- Signal Words and Relative Impact of Pesticides Registered for Use on Hop
on Representative Non-target Beneficial Arthropods

Insecticides/Miticides		Beneficial arthropod IOBC rankings ¹			
Active Ingredient	Signal word	Trade Name	Predatory mites	Lady beetles	Lacewing larvae
Abamectin	Warning	Agri-Mek & other formulations	3	3	ND
<i>B. thuringiensis</i> subsp. aizawal	Caution	Xentari & other formulations	1	2	ND
<i>B. thuringiensis</i> subsp. kurstaki	Caution	Dipel & other formulations	1	2	ND
Beta-cyfluthrin	Warning	Baythroid XL	4	4	4
Bifenazate	Caution	Acramite-50WS	1	2	ND
Bifenthrin	Warning	Brigade & other formulations	4	4	4
Cyfluthrin	Danger	Baythroid 2E	4	4	4
Dicofol	Caution	Dicofol	1	1	ND
Etoxazole	Caution	Zeal	OK ²	OK ²	ND
Fenpyroximate	Warning	Fujimite	1	3	ND
Hexythiazox	Caution	Savey 50DF	1	1	ND
Imidacloprid	Caution	Provado & other formulations	1	3	3
Malathion	Warning	Various formulations	2	4	3
Naled	Danger	Dibrom	2	4	3
Pymetrozine	Caution	Fulfill	1	1	1
Pyrethrin	Caution	Pyganic & other formulations	2	2	2
Spinosad	Caution	Success & other formulations	2	2	1
Spirodiclofen	Caution	Envidor	2	2	1
Spirotetramat	Caution	Movento	1	1	1
Thiamethoxam	Caution	Platinum Insecticide	1	1	ND

¹International Organization for Biological Control (IOBC) has categorized pesticides using a ranking of 1 to 4. Rankings represent relative toxicity based on data from studies conducted with tree fruit, hop, mint and grape. 1= less than 30% mortality following direct exposure to the pesticide; 2 = 30 to 79% mortality; 3 = 79 to 99% mortality; and 4 = greater than 99%. ND = not determined.

²IOBC rankings not available for this newly registered product. Tests in 2009/2010 determined these compounds safe on predatory mites and *Stethorus*.

Source: Pacific Northwest Hop Handbook 2010

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